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(54) A PIPE FOR COLLECTING GASES WHEN A TANK
 IS FILLED

(71) We, COMPAGNIE GENERALE D'AUTOMATISME, a French Corporation, of 12 rue de la Baume, 75008 Paris, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a pipe for collecting the gases given off when a tank is filled with inflammable fluid. The filling operation can, more particularly, concern tanker trucks or tanker lorries or, even, any vehicle bearing a tank.

Generally, tubes for fitting a tank with inflammable fluid are capable of moving along their axis, in a substantially vertical direction, so as to be able to go down inside the receptacle to be filled, entering the latter through a suitable orifice called a dome; the tube is inserted fairly deep within the tank so as to be able to fill the tank through an immersed strainer, this giving, more particularly in the case of liquid products, for example petroleum products, the double advantage of avoiding the forming of foam and, the producing of static electricity.

The domes of the receptacles have relatively small cross-sections and, during the filling, a tube immersed in a receptacle takes up the greater part of the cross-section of the corresponding dome. It follows from this that the emission of gases taking place during the filling is thus made fairly difficult.

There are devices providing for the discharge in open air of the gases thus produced, for example by means of a suitable tubing connected up more or less directly to the dome of the receptacle being filled.

It appeared, however during use, that such giving off of gas was particularly polluting and entailed real fire risks.

Furthermore, the very great increase in cost of certain fluid products, more particularly hydrocarbons, has made it apparent that it would be an advantage to collect gases which were previously allowed to escape into the atmosphere.

Devices making it possible to collect vapours given off during the filling with volatile liquids of a tank are already known. Such a device is, for example, described in US Patent No. 3 825 045, British Patent Specification No. 1,434,374. Moreover, the Applicant Company, in their British Patent No. 1 397 815 has described a suspended tube for handling fluid or similar products, the filling tube including a pipe for removing the gases produced during the filling. The pipe leads into a sleeve surrounding the tube and sliding freely on it and bearing in an air-tight manner on the filling opening of the tank.

According to the present invention there is provided an apparatus for collecting the gases given off during the filling of a tank with fluid by means of a filling tube, comprising a pipe having, first and second branches each fitted with valves, a reservoir for collecting the gases given off during the filling connected to the first branch and a fire extinguishing device connected to the second branch.

The gas collecting pipe leads, in its lower part, into a sleeve surrounding the filling tube and sliding freely on it. The sleeve is closed at its upper part by a cover capable of opening under the influence of the pressure inside the sleeve.

In order to follow the movements of the strainer of the filling tube in its vertical movements, the collecting tube comprises a telescopic part.

In one embodiment of the invention, the anti-fire equipment comprises a tank containing an extinguishing fluid com-

municating with a flushing bottle which contains a fluid under high pressure.

A fire detector may be arranged inside the pipe upstream from the branches in relation to the direction of exhaust of the gases.

A distributor actuated by the fire detector may be arranged to control the various valves of the device, so as to stop the supplying of the fluid to be supplied as well as the escape of the gases and vapours given off and also to enable the extinguishing fluid to be conveyed at a high flow rate towards the seat of fire.

The collecting of the gases and vapours discharged may be effected in a known way, by condensation for example.

The two valves may be servo-controlled together so that one of them cannot open until the other is closed.

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawing, in which the single figure is a diagrammatic view of an apparatus for filling a tank.

In the drawing, the upper part of a tank 1 which is intended to be filled has a filling dome 2, it being assumed that this dome is placed beneath a filling tube 3, directly under and coaxial with the latter.

The tube 3 is in the form of a substantially vertical pipe which accommodates, at its upper part, an articulated arm 27, through which the product to be supplied is fed (arrow F1).

At the lower part of the tube 3, there is a stopper 4, which, in usual circumstances, stops up the lower end of the tube 3 in a fluid-tight manner. A jack 5 is fixed to the upper part of the tube 3, coaxially with the latter. This jack makes it possible, by means of the link 6 fixed to the end of rod 7 forming part of the jack 5, to push the strainer 4 downwards when the tube is in the filling position.

The tube 3 is suspended from a carriage 8 capable of moving vertically along a roll path 9, supported by a frame 10 which can, if required, be moved horizontally by means of known devices, not shown.

In the example shown, it is by means of two cables 11 that the tube 3 is assumed to have been suspended, the cables being arranged in the vertical plane passing through the axis of the tube and perpendicular to that of the figure.

A pipe for collecting the gases given off is connected to the filling tube. This pipe is of the telescopic type. It comprises a lower element 12 which ends, at its lower part, in a sleeve or pan 13, coaxial with the tube 3 and surrounding the latter on all sides. At its lower part, this sleeve or pan is tapered, in a manner such that when the tube 3 rises at the same time as

its stopper 4, a collar 14 of the latter is applied in a fluid-tight manner, against the said lower end of the sleeve 13.

This sleeve comprises a large collar 15 capable of stopping up, also in a fluid-tight manner, the dome 2 at a certain moment of the down stroke of the tube. It also comprises perforations, in the part situated below the collar 15, to make the passing of the gases easier.

The external element 16 of the gas collecting pipe of the telescopic type ends, at its upper part, in two branches 17 and 18, stopped up respectively by valves 19 and 20.

At the end of the branch 18, a tank 21 is provided which contains extinguishing fluid, this tank communicating, in its turn, with a flush bottle 22 through an isolation valve 23.

An aerothermal detector 24 is placed inside the lower element 12 of the gas collector pipe in the path of the discharged gases, the function of that device being to start up the action of the anti-fire device by means of a connection 25 leading to a distributor 26. Instructions coming from the latter cause the opening of the valves 20 and 23 as well as the simultaneous closing of the valve 19 and of the inlet valve, not shown, for the product being supplied.

It follows that the gases which previously moved towards the collecting system are stopped and that the fluid under high pressure contained in the bottle 22 drives out the extinguishing fluid from the tank 21 in the direction of the arrow F3, this fluid then going down the sleeve 13. The extinguishing fluid is then forced into the tank being filled after having traversed the sleeve 13. During the filling operation the tube is lowered into the tank and the collar 15 of the sleeve 13 bears against the dome 2 of the tank, and the upper part of the lower internal element 12 is below the connection of the branch 17.

In the embodiment which has just been described it has been assumed that the tube 3 was constituted by a single section 3, fed, at its upper part, by the articulated arm 27 and comprising at its lower part, the stopper 4.

Nevertheless, other forms of the tube are possible. More particularly, it is possible, just as in the case of the collecting pipe, to make the tube 3 of the telescopic type. In this latter case, the filling tube 3 can be suspended in a similar manner to the tube 3 just described. Alternatively, the inner tube could be fixed and the outer tube raised and lowered between the filling position and the raised position clear of the tank.

In another embodiment, the collecting pipe having a diameter which is sub-

stantially greater than that of the tube 3, can be arranged to contain entirely the latter, the gases then escaping into the cylindrical space enclosed between the collecting pipe and the tube 3.

In the following part of the description, the operation of the device will be described.

At the beginning of the filling operation, the filling tube 3 and the internal element 12 of the collecting tube as well as the sleeve 13 and the strainer 4 are at the top point of their stroke. The tops of the tanks to be filled up are therefore completely cleared and these latter can be moved at will.

The first tank 1 to be filled is then arranged so that its filling orifice or dome 2 is directly under the tube 3 coaxially with that tube.

The assembly is then moved downwards, the jack 5 being in the retracted position, the stopper 4 and more particularly its collar 14, being held by means of the links 6, strongly pressed against the lower edge of the filling tube 3 thus ensuring the complete fluid-tight sealing of the tube.

The sleeve 13 also bears against the collar 14 of the strainer, so that the internal element 12 of the gas collecting pipe, an element which is fast with the sleeve 13, follows the tube 3 in the downward movement of the latter.

When the collar 15 fast with the sleeve 13 has just borne against the horizontal edge of the dome 2, the tank to be filled is also stopped up in a fluid-tight manner, due to this contact. On account of the pressing of the collar 15 on the dome 2, the downward movement of the assembly formed by the sleeve 13 and the internal element 12 is stopped and the assembly formed by the elements 12 and 13 remains in the same position during the whole filling operation.

After the stopping of the tank, the tube 2 continues its downward movement until a previously fixed level depending on the level of the bottom of the tank is reached. It is only at this point that the filling can begin, the contact of the collar 15 on the edge 2 controlling the withdrawal of the rod 7 from the jack 5, this removing the strainer from the lower edge of the filling tube 3.

When the filling is ended, the tube 3 is raised, its lower end still being open, then when the collar 15 leaves the edge 2, the rod 7 of the jack 5 is retracted, this placing the stopper 4 again in the stopping up position on the lower end of the filling tube 3.

The upward movement of the tube 3 thus continues until the high point of its stroke.

It will be seen that, during the whole filling operation, the gases and vapours inside the tank can escape through the tubular space remaining free between the tube 3 and the sleeve 13, to pass subsequently through the elements 12 and 16 whose branch 17, which is well cleared because of the lowering of the said element 12, allows the aforementioned gases to escape through the valve 19 into the collecting system, not shown.

The valve 20 is closed throughout the operation.

In the case where a signal should be emitted by the detector 24, subsequent to an abnormal rise in the temperature of the gases, instructions are immediately sent out through the distributor 26 on the one hand, to cause the closing of the supply valve (not shown), of the articulated arm 27, to close the valve 19 and to open the valves 23 and 20. The fluid under high pressure contained in the bottle 22 then vigorously drives out the extinguishing fluid contained in the tank 21 towards the seat of fire, in the direction of the arrow F3, passing through the valve 20, the branch 18 and the elements 16 and 12 of the telescopic collecting pipe.

With this arrangement, the sleeve 13 is closed, at its top part, by a cover 28 forming a valve and capable of opening if the pressure inside the sleeve exceeds a certain value. The cover thus fulfills two functions: on the one hand, in the case of accidental excessive pressure, it limits the pressure inside the receptacle, and on the other hand, in the case of fire, and if the pressure of the extinguishing fluid is sufficient, it provides a path for any excess extinguishing fluid towards the outside part of the receptacle, in the zone where the supplied product is in danger of overflowing and spreading fire.

WHAT WE CLAIM IS:—

1. An apparatus for collecting the gases given off during the filling of a tank with fluid by means of a filling tube, comprising a pipe having, first and second branches each fitted with valves, a reservoir for collecting the gases given off during the filling connected to the first branch and a fire extinguishing device connected to the second branch.

2. An apparatus for collecting gases as claimed in Claim 1, wherein the pipe is telescopic.

3. An apparatus for collecting gases as claimed in Claim 1, wherein the fire extinguishing device comprises a tank containing an extinguishing fluid communicating with a flush bottle which contains a fluid under pressure.

4. An apparatus for collecting gases as

claimed in any one of Claims 1 to 3, wherein a fire detector is arranged inside the pipe upstream from the branches in relation to the direction of exhaust of the
5 gases.

5. An apparatus for collecting gases as claimed in Claim 4, wherein a distributor actuated by the fire detector is arranged to control the various valves of the device so
10 that, in the event of fire, the valve in the first branch is closed to prevent the escape of the gases and vapours given off, and the valve in the second branch is opened to enable the extinguishing fluid to be forced
15 under pressure into the tank.

6. An apparatus for collecting gas as claimed in Claim 5 in combination with a

tank filling tube, wherein said distributor is also arranged to close a valve in the tank filling tube in the event of fire. 20

7. An apparatus for collecting gases during the filling of a tank substantially as herein described with reference to the accompanying drawing.

8. Tank filling apparatus incorporating
25 an apparatus for collecting gases as claimed in any one of Claims 1 to 6.

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